

DOCKET NO: 272999US0PCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :
MARTIN SOHN, ET AL. : EXAMINER: BROOKS, CLINTON
SERIAL NO: 10/539,802 :
FILED: JUNE 20, 2005 : GROUP ART UNIT: 1621
FOR: METHOD FOR THE CONTINUOUS :
PRODUCTION OF ISOCYANATES

APPEAL BRIEF

SIR:

The following is an appeal of the examiner's final rejection of December 17, 2009 of claims 1-20 as obvious. A Notice of Appeal was timely filed on March 17, 2010.

(i) Real Party In Interest

The real party in interest is BASF AG, now BASF SE, by assignment recorded at reel/frame 016788/0307-09.

(ii) Related Appeals And Interferences

Appellants, appellants' legal representative and the assignee are not aware of any related appeals and interferences which will directly affect or be directly affected, or have a bearing on the Board's decision in the pending appeal. Any copies of decisions rendered by a court or the Board, if any, in any proceeding identified would be attached as related proceedings appendix (x).

(iii) Status Of Claims

Appellants' state the status of all the claims in the proceeding as follows:

Claims 1-20 are rejected and active in this application and are herein appealed.

No claims have been identified as allowed or confirmed.

No claims have been identified as withdrawn.

No claims have been identified as objected to.

No claims have been canceled.

(iv) Status Of Amendments

No amendments after final rejection have been requested. A copy of the claims herein appealed is attached as appendix (viii).

(v) Summary of Claimed Subject Matter

The claimed invention is directed to a process for preparing at least one polyisocyanate comprising (pg 23, lines 1-2)

reacting organic amines with phosgene in an inert solvent (pg 23, lines 2-3 and 18-20),

wherein the reaction is carried out in at least three stages (pg 23, lines 3-4),

with the first stage being carried out in a mixing apparatus (pg 23, lines 4-5),

the second stage in at least one residence apparatus and (pg 23, line 5)

the third stage in at least one reaction column and (pg 24, lines 37-38)

the pressure in each successive stage being lower than that in the previous stage (pg 23, lines 7-8)

wherein in said third stage, a carbamoyl chloride is dissociated into isocyanate and hydrogen chloride (pg 23, lines 14-16).

Isocyanate preparation by reaction of an amine with phosgene is generally known. However issues as to yield and space-time yields prompts further investigation into efficient preparation methods of isocyanates.

The claimed invention addresses this problem by providing a process for preparing at least one polyisocyanate by reacting organic amine and phosgene in an inert solvent, in at least three stages, **the pressure in each successive stage being lower than the previous stage**, and wherein in the third stage, a carbamoyl chloride is dissociated into isocyanate and hydrogen chloride. Appellants have discovered that such a process in which the pressure is successively lower in at least three sequential stages, allows for the efficient production of polyisocyanates. Such a process is nowhere disclosed or suggested in the cited art of record.

Claim 1 is the only independent claim involved in this appeal, whose subject matter is defined above.

No means plus function or step plus function as permitted by 35 U.S.C. 112, sixth paragraph are used and therefore none are identified.

(vi) Grounds Of Rejection To Be Reviewed On Appeal

1) The rejection of claims 1-20 under 35 U.S.C. §103(a) over Penzel et al. WO 99/54289 as evidenced by Penzel et al. U.S. 6,576,788 is presented for review.

(vii) Argument

The examiner has committed reversible error in concluding the claimed invention to be obvious over the cited reference as the cited art of record fails to disclose or suggest the claim limitation of the pressure in each successive of three stages, to be lower than that of the preceding stage.

Penzel et al. is cited for a disclosure of a **two-stage reaction** of diphenylmethanediamines and polyphenylpolymethylenepolyamines with phosgene in an organic solvent (see abstract). A three stage reaction is not disclosed (page 7, lines 7-8 of appealed rejection) Further, there is no disclosure of a pressure drop along three successive stages.

In contrast, the claimed invention is directed to a polyisocyanates producing process in which at least three stages are used, **the pressure is reduced in successive stage.**

Pressure Drop In Three Successive Stages Not Disclosed

Page 6 of the official action asserts that “natural pressure drop across the system is reasonably expected” an assertion which is made in the **absence of any evidence** in support thereof. Thus, as to the claim limitation of pressure drop over successive stages, the examiner does not even assert that the limitation is inherent but rather merely assert the limitation to be “reasonably expected.” Such a standard does not meet the burden placed on the examiner.

There is no evidence of record to suggest that a pressure drop along successive stages to be either natural or expected. Thus, in the absence of any evidence in support of the examiner’s assertion, the decision of the examiner must be reversed.

Dissociation Into Two Gaseous Molecules Would Increase Pressure

The examiner has erroneously asserted that a pressure drop across the system to be natural and reasonably expected.

In response to the examiner's unsubstantiated assertion, appellants have provided the examiner with principled scientific reasoning as to why a pressure drop across the system is not necessarily natural.

In a third stage of the claimed process a second stage carbamoyl chloride is dissociated into an isocyanate and hydrogen chloride gas. The dissociation of a single molecule into two molecules, in which one of the products, is a gas (HCl), would be expected to increase the pressure in the system, due to the generation of a molecule of gas. Such an increase in pressure is independent of the specific nature of the carbamoyl chloride. If carbamoyl chloride is a liquid, dissociation would, at worst, yield one mole of liquid isocyanate and one mole of gaseous HCl. The pressure of the liquid isocyanate and gaseous HCl would be greater than that of the liquid carbamoyl chloride. If the carbamoyl chloride were a gas, dissociate would, at worst yield one mole of gaseous isocyanate and one mole of gaseous HCl. The pressure of the two moles of gas (isocyanate and HCl) would be greater than that of one mole of gaseous carbamoyl chloride. Thus, the chemistry of the dissociation process would not naturally provide a decrease in pressure between the second and third stages.

Since the dissociation of carbamoyl chloride into isocyanate and HCl would otherwise **increase the pressure**, it would not be obvious to conduct a process in which the pressure of such a dissociative step was **reduced relative to the pressure of the previous stage**.

The examiner's response to such scientific reasoning was to cite in the advisory action that the reference process allows for the removal of HCl, which **could** create a pressure drop.

The examiner's reasoning is all over the place.

First the examiner assert that a pressure drop would naturally occur across the system. However, when presented with scientific reasoning as to the flaw in his reasoning, the examiner now notes that the pressure could be reduced as a result of removal of HCl. Thus, the examiner's himself does not believe that a pressure drop would be natural and reasonably expected.

None the less, even entertaining the examiner's new reasoning in the advisory action, the mere removal of HCl does not suggest a pressure reduction over three successive stages since there is no disclosure of any relationship as to the pressure across the stages. While removal of HCl could reduce the absolute pressure, there is no suggestion to reduce the pressure relative to the preceding stage.

Thus, again, the examiner's decision must be reversed as a pressure reduction is admittedly not natural and not suggested.

Furthermore, the only disclosure in Penzel et al. relating to pressure is the operation at **a single column pressure** of 4.3 bar (column 8, line 16). This single pressure, at a single stage, fails to suggest the claim limitation of the **pressure in each successive stage being lower than that of the previous stage**. The examiner erroneously concludes that a single pressure in a single stage provides a disclosure of a pressure reduction over three stages.

Examiner's Citation Of A Lower Pressure Is At A Single Operating Pressure

In the advisory action, the examiner concludes that operation at a lower pressure is shown to impact the iodine color number.

There is no basis for the examiner's conclusion.

The examiner has noted the difference in iodine color number for example 1 and comparative example 1 and concluded that the higher column operating pressure is responsible for this difference and therefore a lower pressure is advantageous.

First, the differences in product when the column is operated at different pressures is not a disclosure of a pressure reduction over three stages. Again a single operating pressure does not suggest a pressure reduction over three stages.

No Evidence That Lower Operating Pressure Produces Lower Iodine Color Value

Second, the examiner's conclusion as to the effect of operating pressure is spurious, at best.

The examiner has concluded the difference in iodine color number to be the result of different column operating pressure, but has ignored the overt differences in 1) nozzle exit temperature (118°C v. 96°C), 2) valve tray column entry temperature (92°C v. 78°C), 3) a temperature at the bottom of the column of 95-97° v. 116°C, 4) a phosgene/HCl mass ratio at the bottom of 14.2:1 v. 9.2:1, and 5) a phosgene/HCl mass ratio at the top of the column of 1.6:1 v. 0.95:1. In spite of all of these other differences, the examiner is able to conclude that it is a lower operating pressure which provides for a reduce iodine color number. The examiner's technical conclusion is simply not supported by the evidence.

No Suggestion Of A Lower Pressure In A Third Stage

The official action recognizes that a three stage process is not disclosed in the art, yet asserts a three stage process to be none the less obvious.

Notwithstanding the lack of a disclosure of a three stage process, even if it were obvious to conduct such a polyisocyanate forming reaction in three stages, there is still no suggestion of a pressure reduction between the second and third stages. Quite simply, since there is no disclosure of a three stage process, only a two stage process, it can not have been obvious to operate a third stage at a reduced pressure relative to the preceding stage. The lack of any disclosure of a third stage precludes any conclusion as to the operating pressure relative to a preceding stage since there is no disclosed relationship there between.

No Suggestion To Dissociate Carbamoyl Chloride In A Third Stage Reaction Column

The examiner has recognized that Penzel et al. describes only a two stage reaction (Page 4, lines 15-19 of the appealed rejection).

The '788 patent teaches a process for preparing at least one polyisocyanate comprising reacting organic amines with phosgene in an inert solvent wherein the reaction is carried out 'by a two-stage reaction...' "

Column 5 of the reference identifies a first stage of the phosgenation being carried out in a static mixer and the second stage of the phosgenation being carried out in residence time apparatus. Thus, the two stages of the reaction are conducted in a static mixer and a residence time apparatus. There is no disclosure of the claim limitation of a third stage, in which carbamoyl chloride is dissociated, being conducted in at least one reaction column. This claim

limitation is not suggested as the cited reference fails to suggest a three stage reaction. Accordingly the examiner has erroneously concluded the claimed invention to be obvious in the complete absence of a disclosure of a third reaction stage and conducting such a stage in at least one reaction column.

Claim 7

Notwithstanding the arguments presented above, claim 7 is separately patentable for the reasons as follows.

Claim 7 recites the separation of phosgene in the reaction column of the third stage. Since Penzel et al fails to suggest a three stage reaction, there can be no suggestion of conducting removal of phosgene in a third stage of a reaction column. Stage two of the two stage reaction of Penzel et al. is conducted in a residence time apparatus. Thus, there is no suggestion of removal of phosgene in a third stage of a reaction column.

In view of the errors committed by the examiner, his conclusion of obviousness is in error and must be reversed.

Respectfully submitted,

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(viii) Claims Appendix

Claim 1: A process for preparing at least one polyisocyanate comprising reacting organic amines with phosgene in an inert solvent, wherein the reaction is carried out in at least three stages, with the first stage being carried out in a mixing apparatus, the second stage in at least one residence apparatus and the third stage in at least one reaction column and the pressure in each successive stage being lower than that in the previous stage wherein in said third stage, a carbamoyl chloride is dissociated into isocyanate and hydrogen chloride.

Claim 2: The process of claim 1, wherein the at least one polyisocyanate is diphenylmethane diisocyanate (MDI), polyphenylene-polymethylene polyisocyanate (PMDI), tolylene diisocyanate (TDI), hexamethylene diisocyanate (HDI), isophorone diisocyanate (IPDI), or a mixture of diphenylmethane diisocyanate (MDI) and polyphenylene-polymethylene polyisocyanate (PMDI).

Claim 3: The process of claim 1, wherein a nozzle is used as the mixing apparatus for the first stage.

Claim 4: The process of claim 1, wherein a tube reactor, a stirred vessel, an unstirred residence apparatus or a phase separation apparatus for gas and liquid phases is used as the at least one residence apparatus for the second stage.

Claim 5: The process of claim 1, wherein the residence time in the residence apparatus of the second stage is from 1 second to 30 minutes.

Claim 6: The process of claim 1, wherein the at least one residence apparatus of the second stage comprises at least two reactors of the same or different types which are connected in parallel, in series, or in a combination thereof.

Claim 7: The process of claim 1, wherein the phosgene is separated off in the at least one reaction column of the third stage.

Claim 8: The process of claim 1, wherein the pressure is reduced from the pressure of the mixing apparatus of the first stage to the pressure of the residence apparatus of the second stage by a regulating device.

Claim 9: The process of claim 1, wherein the pressure is reduced from the pressure of the at least one residence apparatus of the second stage to the pressure of the at least one reaction column of the third stage by a regulating device.

Claim 10: The process of claim 1, wherein the mixing apparatus of the first stage is integrated into the at least one residence apparatus of the second stage.

Claim 11: The process of claim 1, wherein the pressure upstream of the mixing apparatus is 3-70 bar.

Claim 12: The process of claim 1, wherein the temperature in the first, second and third stages is in each case 80 -190 °C.

Claim 13: The process of claim 1, wherein an aromatic hydrocarbon, a chlorinated aromatic hydrocarbon, or a mixture thereof is used as the inert solvent.

Claim 14: The process of claim 1, wherein the residence time in the at least one residence apparatus of the second stage is from 30 seconds to 10 minutes.

Claim 15: The process of claim 1, wherein the residence time in the at least one residence apparatus of the second stage is from 2 to 7 minutes.

Claim 16: The process of claim 8, wherein the regulating device is a regulating valve.

Claim 17: The process of claim 9, wherein the regulating device is a regulating valve.

Claim 18: The process of claim 1, wherein the pressure upstream of the mixing apparatus is 15-45 bar.

Claim 19: The process of claim 1, wherein the pressure in the reactor of the second stage is 2.5-35 bar.

Claim 20: The process of claim 1, wherein the temperature in the first, second and third stages is in each case 90-150 °C.

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(ix) *Evidence Appendix*

none

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(x) *Related Proceedings Appendix*

none